c. 1691

THE MEASURER's GUIDE:

OR, THE

Whole ART OF Meaſuring

MADE Short, Plain and Eaſie.

SHEWING,

1. How to Meaſure any Plain Superficies.
2, How to Meaſure all ſorts of Regular Solids.
3. The Art of *Gaugeing.*
4. How to Meaſure Artificers Work, *viz.* *Carpenters*, *Joyners*, *Plaſterers*, *Painters*, *Paviers*, *Glaziers*, *Bricklayers*, *Tylors*, &c. of Singuler uſe to all Gentlmen, Artificers and others.

By JOHN BARKER.

LONDON:
Printed for Tho. *Saluſbury*, at the *King's* A *rmes*,
next *Cliffords* Inn-Lane, by St. *Dunſtan's* Church
in *Fleet-ſtreet*.

[ca 1700]

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~~about 1691~~

BARKER (John)

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B L

TO

EDW. H*UBBALD* Gent.

THIS Small Treatiſe of Meaſuring, is Humbly preſented, and Dedicated; By,

SIR,

Your Kinſman,

and

Humble Servant,

J. BARKER,

To the READER.

THE *Art of* Meaſureing *is of ſuch* Singular *Uſe to all* Sorts *of Perſons*, *that to ſay any thing of it, would be to as little Purpoſe, as to tell any Perſon it is day, when the* Sun *is in the* Meridian. *As to this Small* Treatiſe, *the Method I have uſed therein is both* Short, Plain, *and* Eaſy; *So that the Meaneſt* Capacity *may Attain to* Meaſure, *without the help of a Maſter*; *There being more Variety in this than in any other Book that is yet Extant, which Treats upon this* Subject. *In the firſt two* Chapter, *I have Shewed how to* Meaſure *any ſort* *of* Superficies, *and* Solids *of what Form ſoever. Wherein I have ſet forth the great* Errors *committed by the Common* Meaſurers, *in* Meaſuring *of Round Timber. In the Third* Chapter, *I have* **Taught** *how to* Gauge *any ſort of Veſſel. And in the Fourth* Chapter *I have given Inſtructions how to* Meaſure *all* Artificers Work, *where I alſo ſhew how to find the* Superficial Content *of any* Regular Solid; *All which is Performed without the help of* Tables: *For many Times he that uſes himſelf to* Meaſure *by the help of* Tables, *can Perform nothing without 'em; farther, if he leaves his* Tables *behind him, or that they come by* *any* Miſchance, *he is Infinitely at a* Loſs,*inſomuch as he can do nothing; and ſuch a Perſon had as good leave his Brains behind him. Whereas any* Perſon *may eaſily carry all the Rules here Delivered in his Head, and thereby* Meaſure *any thing with as much eaſe and expedition as by moſt* Tables. *All that I ſhall* Add *is this, that as I have been perſwaded, after many Importunities, to Publiſh theſe few* Sheets *for Publick Good,* So *if the* Reader Reap *any Benifit thereby I have my* Ends, *in proveing* Servicable *to the General* Advantage *of my Country.*

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ERRATA.

Pag. 1. in the Title, Inſtead of *Superfices*, Read *Superficies*. P. 54. L. 5. for 44.64 *Inches*. Read 4464. P. 25. L 5. for *Superfices* Read *Superficies*.

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CHAP. I.

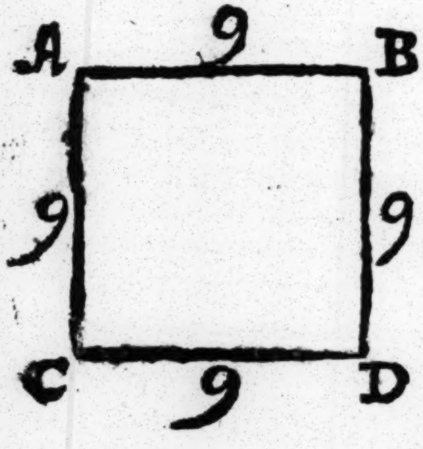
How to meaſure any Plain Superfices.

PROP. I.

HOW *to find the Superficial Content of a Geometrical Square.*

Example.

Admit there is a *Square* repreſented by the Figure A B C D, whoſe ſides are each Nine Feet, whoſe Area, or Superficial Content is required.



To find which, multiply its ſide 9 by its ſelf, and the product will be 81 Feet, which is the Content of that Square.

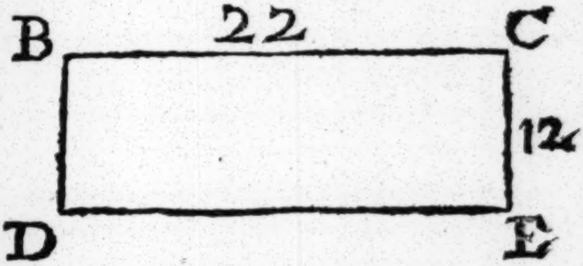
PROP. II.

How to find the Superficial Content of a Parallelogram, or long Square.

Multiply the length by the breadth, and the Product will be the Content thereof.

Example.

Admit there is a long Square repreſented by the Figure B C D E, whoſe length B C is Twenty Two Inches, and breadth B D Twelve Inches, whoſe Content is required.



To find which, multiply the length 22, by the breadth 12, and the Product will be 264 Inches, which is the Content of the long Square required, which you may reduce into Feet, by dividing the ſame by 144, the Number of Inches contained in a ſuperficial Foot, and the Quotient will be 1 Foot, and 120 will remain with $\frac{120}{144}$ of a Foot, which is 10 Inches.

But this way of Working being very tedious and troubleſome, by reaſon of the Reduction; for your Multiplier, and Multiplicand, muſt be reduced both into the Loweſt Denomination, and afterwards reduced into Feet. I would adviſe the young Artiſt to work by Decimals; and for that end, to provide himſelf of a Two-Foot Rule, on which each Foot ſhall be divided into Ten equal parts, and each of thoſe parts into Ten other equal parts: So is the Foot divided into 100 equal parts, and thereby is fit to take the Dimenſions in Feet, and parts of a Foot; by which Rule, if the Dimenſions of the Square in the laſt Example, was taken, the length B C would be 1.83 Feet, and the breadth, B D, 1 Foot. Then if you multiply the length by the breadth, as before, the Product will give 1.83, or 1 Foot 10 Inches very near. So is the Content found without any more trouble; which Method I have made uſe of in ſome of the Examples in the following Diſcourſe of Meaſuring of *Superfices* and *Solids*; but in ſuch ſort, as any perſon that underſtands not Decimal Arithmetick, may eaſily apply them to Vulgar Arithmetick. But generally I have given the Examples in Integers or Feet.

If it happens, that any long Square Superfices, be broader at one end than at the other, whoſe Content is required, firſt add the two ends together, and take half their Sum for the true breadth, and multiply it into the length, and the Product will be the Content thereof.

Example.

Admit there is a peice of Glaſs, or any other Superfices, that is One Foot broad at one end, and Two Feet broad at the other, and *Six* Feet long, whoſe Content is required.

To perform which, add the two ends together, *viz.* One Foot and Two Feet, and their Sum will be Three Feet, the half of which is 1.5 Foot, or One Foot Six Inches; which multiply into the length Six Feet, and the Product will give Nine Feet for the Content required.

PROP. III.

How to find how much in Length of any Long Square Superfices goes to make a Superficial Foot.

Divide 1 by the given breadth, and the Quotient will give how much of the length of any Superfices goes to make a Superficial Foot thereof.

Example.

Admit there is a long ſquare piece of Board, or any other Superfices, whoſe breadth is 1.32 feet, and it be required, to know how far one ought to meaſure along the ſame to make a ſuperficial foot thereof.

To perform which, divide 1 by the breadth, 132, and the Quotient will give 757, which is Nine Inches and ſomething more; and ſo much of the Length goes to make a ſuperficial foot, as in the following Work.

```
1.32) 1.00000(.757
      924
      ———
       760
       660
      ————
      1000
       924
      ————
        76
```

PROP. IV.

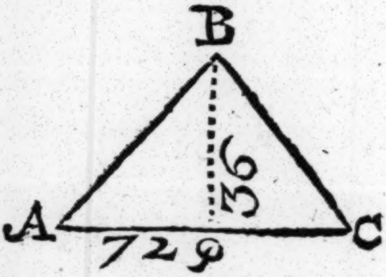
How to find the ſuperficial Content of a Right lined Triangle.

Although Right lined Triangles are of ſeveral Kinds and Forms; as, firſt, in reſpect of their Angles, they are either Right Angled or Oblique Angled, Acute Angled or Obtuſe Angled. Second, in reſpect of their ſides; They are either an Equilateral, Iſoſceles, or Scalenium Triangle. But ſeeing they are all meaſured by one and the ſame Rule, I ſhall add but One Example for all; and take this for a general Rule.

Multiply half the Perpendicular into the Baſe, and the Product will be the Content of the Triangle; or Multiply half the Baſe into the whole Perpendicular, and the Product will give the ſame thing: Or if you Multiply the whole Baſe into the whole Perpendicular, half the Product is the Content of the Triangle.

Example.

Admit there is a Triangle A B C, whoſe Baſe A C is 72 feet, and the Perpendicular B Q is 36 feet, whoſe Content is required.



To find which, multiply half the Perpendicular, which is 18 feet, into to the Baſe 72 feet, and the Product will be 1296 feet, which is the Content of the ſaid Triangle.

Or thus,

Multiply half the Baſe, which is 36 feet, into the Perpendicular 36 feet, and the Product will give 1296 feet, as before, for the Content of the ſaid Triangle.

PROP. V.

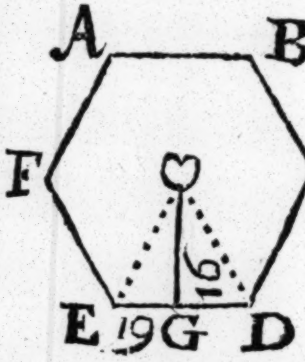
How to find the Superficial Content of a Polygon, or many equal ſided Superfices.

Multiply the Length of the Perpendicular let fall from the Center to the middle of one of the ſides, into half the Sum of the ſides, or half the Perpendicular into the Sum of the Sides, and the Product ſhall be the Content of Polygon.

Example.

Admit the Polygon given be a Hexagon, repreſented by the Figure A B C D E F (or a Six equal ſided

Figure), whoſe ſide is 19, and the Perpendicular, or ⊙ G, is 16 feet.



Multiply half the Sum of the ſides, which is 57, by the length of the Perpendicular 16, and the Product will be 912 feet, which is the Content of the Polygon required.

Or,

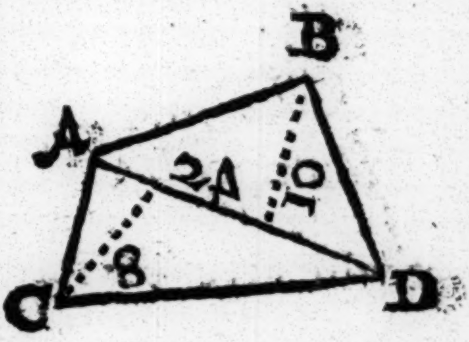
Multiply the Sum of all the ſides, which is 114, by half the Perpendicular 8, and the Product will give 912, as before, for the Content of the ſaid Polygon.

The reaſon of this manner of Working is very plain, if from the Center you draw the Lines ⊙ E and ⊙ D, thereby making the Triangle E ⊙ D, whoſe Content (by the third Propoſition) is found by Multiplying the Perpendicular ⊙ G 16 into half the ſide E D, which is 9:5, and there being in the Hexagon 6 ſuch Triangles, therefore the Perpendicular ⊙ G being Multiplied into 6 times half, the ſide D E produceth 912 for the Content as before.

PROP. VI.

How to find the Superficial Content of a Trapezium or Table.

A Trapezium is a Figure conſiſting of four unequal ſides, and as may unequal Angles, as is the Figure following, A B C D.



To Meaſure which Trapeziums you muſt firſt reduce it into two Triangles, by drawing the Diagonal Line:

Line A D, and ſo is your Figure reduced into two Triangles, *viz.* the Triangle A B D and A C D, then if you let fall Perpendiculars from the two Points B and C, if you find the Content the two Triangles, and add their Content together, the Sum will be the Area or Content of the whole Trapezium.

Example.

Having drawn the line A D, and ſo Reduced the Figure into two Triangles, and let fall the Perpendiculars from B and C (the Baſe A D is common to both Triangles) admit the Baſe A D to be 24, and the Perpendicular at C to be 8, and the Perpendicular at B to be 10, then, if according to Propoſition the 3d, you Multiply 24, the Baſe by 4, half the Perpendicular, the Product will give *96* for the Content of the Triangle A C D.

Likewiſe, if you Multiply 24, the Baſe by 5, half the other Perpendicular, the Product will give 120 for the Content of the Triangle A B D.

Then if you add the Content of theſe two Triangles together, *viz.* 96 and 120, their Sum is 216, which is the Content of the whole Trapezium A B C D.

Or thus,

Add the two Perpendiculars, *viz.* 10 and 8 together, and Multiply half the Sum, which is 9, into the common Baſe A D 24, and the Product will give 216, for the Content of the Trapezium A B C D, as before.

Or thus,

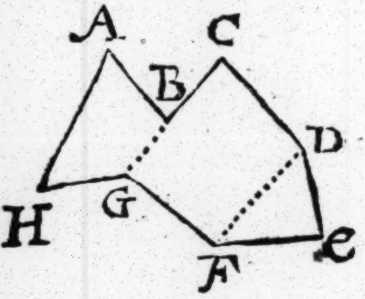
Multiply half the common Baſe A D, which is 12, into the Sum of the two Perpendiculars, which is 18, and the Product will give the ſame as before, *viz.* 216, for the Content of the Trapezium.

PROP. VII.

How to Reduce Irregular Figures into Trapeziums and Triangles, and to find the Content thereof.

Example.

Let the Figure given to be Meaſured be A B C D E F G H.



To perform which, Divide the Figure into Trapeziums and Triangles, according to your Fancy, and as the nature of the Plain will bear, then find the Content of the Trapeziums and Triangle, as is taught in the third and fifth Propoſitions, and add the ſeveral Contents together, ſo will the Sum be the Content of the Irregular Figure deſired. As in this Example, draw the lines B G and D F, ſo is the whole Figure divided into two Trapeziums and one Triangle, *viz.* the Trapeziums A B G H, and C D F G, and the Triangle D E F, the Content of which being ſeverally found by the third and fifth Propoſitions, and added together, their Sum will be the Content of the whole Figure.

PROP. VIII.

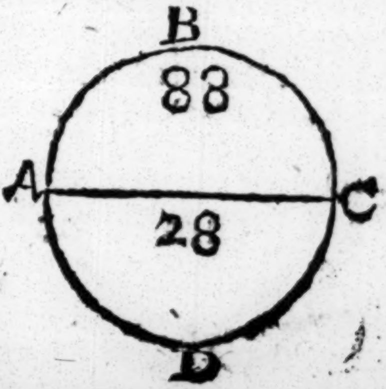
By the Diamiter of a Circle to find the Circumference.

To find which, the Analogy, or Proportion, is as followeth.

As 7 is to 22,
So is the Diamiter of the Circle,
To the Circumference.

Example.

Admit there is a Circle repreſented by the Figure A B C D, whoſe Diamiter A C is 28, whoſe Circumference is required.



To find which, work by the foregoing Proportion, ſo will you find the Circumference to be 88, as in the following work.

As 7 : 22 : 28
22

56
56

7) 616 (88
56

56
56

(0)

PROP. IX.

How by the Circumference of a Circle given to find the Diamiter.

To find which, the Analogy, or Proportion, is as followeth.

As 22 is to 7
So is the Circumference of any Circle
To the Diamiter.

Ex

Example.

Admit the Circumference, the foregoing Circle A B C D be given, which was found to be 88, whoſe Diametre is required.

Work by the fore-going Proportion, and ſo will you find the Diametre of the ſaid Circle to be 28, as in the following Work.

```
As 22 : 7 : 88
               7
        22)616(28
           44
           ---
           176
           176
           ---
           (0)
```

P R O P. X.

How to find the Content of a Circle having the Diamiter and Circumference given.

To find which, Multiply half the Circumference by half the Diamiter,

miter, and the Product is the Superfitial Content of the Circle.

Example.

Admit there is a Circle repreſented by the foregoing Figure, whoſe Circumference A B C D is 88, and the Diamiter A C 28, whoſe Superficial Content is required.

To find which, Multiply half the Circumference, which is 44, by half the Diamiter, which is 14, and the Product will give *616*, which is the Content of the ſaid Circle required.

PROP. XI.

How to find the Superficial Content of a Circle, having only the Diamiter given.

To perform which, firſt ſquare the Semy-Diamiter, and then work by the following Proportion.

As 7 is to 22,
So is the Square of the Semy-Diamiter
To the content of the circle.

Example.

Admit there is a circle whoſe Diamiter is 28, and it be required to find the content of the ſaid circle.

To perform which, firſt halve the Diamiter, the half of which is 14, which 14 Multiply into its ſelf, and the Product will give 196, which is the Square of the Semy-Diamiter, then work by the foregoing Proportion, and ſo will you find the ſuperfitial content of the ſaid circle to be 616, as in the following work.

```
 14      As 7 : 22 : 196
 14                  22
----               -----
 56                 392
14                 392
----               -----
196               7)4312(616
                    42
                   -----
                    11
                     7
                   -----
                     42
                     42
                   -----
                     (0)        PROP.
```

PROP. XII.

How to find the Superficial Content of a Circle, having the Circumference only given.

To find which, firſt Square the Circumference, then work by the following Proportion.

As four times 22, which is 88, is to 7,

So is the Square of the circumference

To the content of the circle.

Example.

Admit there is a circle whoſe circumference is 88, and it be required to find the content of the ſaid circle.

To find which, firſt ſquare the circumference 88, whoſe ſquare you will find to be 7744, then work by the foregoing proportion, ſo will you find *616* to be the content of the ſaid circle, as in the following work.

88
88
704
704
7744

If 88 : 7 : 7744
7
88) 54208 (*616*
528
140
88
528
528
(0)

PROP. XIII.

How by the Content of a Circle given to find the ſide of a Square, the ſuperficial Content of which Square ſhall be equal to the ſuperficial Content of the Circle.

To perform which, extract the ſquare Root of the Content of the Circle, which Root is the ſide of the Square deſired.

Example.

Admit the Content of the given Circle be 144, and it be required to find the ſide of a Square, the ſuperficial content of which Square ſhall be equal to the ſuperficial content of the Circle.

To find which, extract the ſquare Root of the content of the Circle, 144, whoſe Root you will find to be 12, which is the ſide of the Square deſired.

PROP. XIV.

How by the Circumference of Circle given, to find the ſide of an Inſcribed Square.

To find which, work by the following Proportion:

As 1.000 is to 0.225,
So is the circumference of any circle
To the ſide of the inſcribed Square.

PROP. XV.

By the Diamiter of a Circle given, to find the ſide of an inſcribed Square.

To find out which, work by the following proportion.

As 1. 0000 is to 0. 7071,
So is the Diamiter of any Circle
To the ſide of the Inſcribed Square.

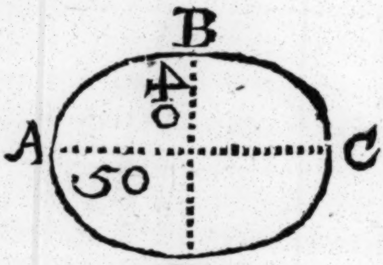
PROP. XVI.

How to find the Superficial Content of an Oval.

Multiply the length by the breadth, and that Product Multiply by Eleven, and that Product Divide by Fourteen and the Quotient ſhall give the Content of the Oval required.

Example.

Admit there is an Oval repreſented by the following Figure, whoſe length A C is 50, and breadth B D 40, whoſe ſuperficial content is required.



To find which, Multiply the length 50 by the breadth 40, and the Product will be 2000, which Multiply by 11, and the Product will be 22000, which Divide by 14, and the Quotient will be 1571, which is the content of the Oval required.

CHAP.

CHAP. II.

How to Meaſure all ſorts of Regular Solids.

HAving in the laſt Chapter ſhewed you how to Meaſure any Plain Superfices, which if well underſtood, the content of all Solid Bodies, whoſe ends are of the ſame Dimenſions, will be found by the following Rule.

Firſt find the ſuperficial content at the end by ſome of the Propoſitions foregoing, and Multiply the ſame by the length, and the Product will give the ſolid content.

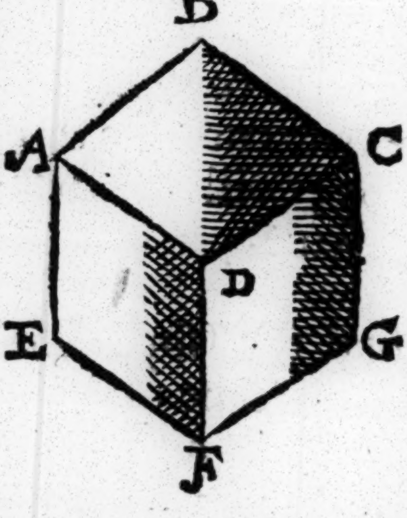
PROP. I.

How to find the ſolid Content of a Cube.

Multiply its ſide into its ſelf, and that Product Multiply by the ſide again, and that Product will be the ſolid content of the cube deſired.

Example.

Admit there is a Cube whoſe ſide is 6 Feet, repreſented by the Figure A B C D E F G, whoſe ſolid content is required.



To find which, Multiply the ſid 6 by its ſelf, and the Product wil be 36, which again Multiply by 6 and the Product will be 216 Feet which is the ſolid content of the ſai Cube.

PROP

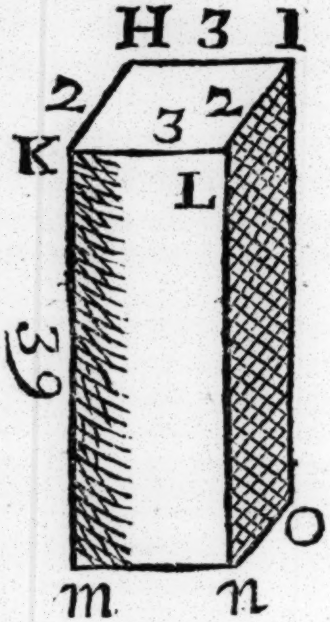
PROP. II.

How to find the Solid Content of a Parallelepipedon, or long Square.

Firſt find the ſuperficial content at the end by Propoſitions, the firſt or ſecond of the laſt Chapter, which Multiply into the length, and the Product will be the ſolid content.

Example.

Admit there is a Parallelepipedon, repreſented by the Figure H I K L M N O, whoſe Square at the end is 3 feet long, and 2 feet broad, and its length, K M, is 39 feet, whoſe ſolid content is required.



To find which, Multiply the length at the top H I 3, by the breadth H K 2, and the Product will give 6, which is the ſuperficial content at the top, which Multiply into the length K M 39 feet, and the Product will be 234 feet, which is the ſolid content of the ſaid Parallelepipedon.

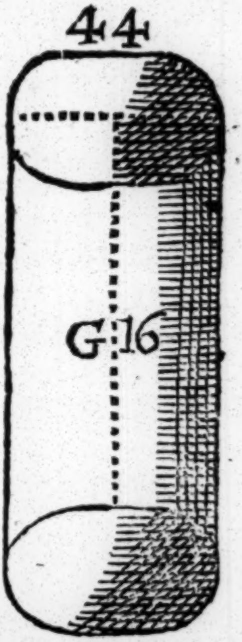
PROP. III.

How to find the ſolid Content of a Cylinder.

Firſt find the ſuperficial content of the circle at the top or baſe (by Propoſition the 10, 11 or 12 of the laſt Chapter) then Multiply it by the length, and the Product will be the ſolid content thereof.

Example.

Admit there is a Cylinder repreſented by the Figure G, whoſe circumference of the circle at the end or baſe is 44 Inches, and the length of the Cylinder 16 Inches, whoſe ſolid content is required.



To find which, firſt find the ſuperficial Content of the Circle at the Top or Baſe, by *Propoſition* the 11*th* of the laſt Chapter, which you will find to be 154 Inches; which multiply by the length 16 Inches, and the Product will be 2464 Inches, which is the Content of the Cylinder required; which you may reduce into feet, by dividing the ſame by 1728, the number of Inches contained in a ſolid Foot, and the Quotient will give 1 Foot, and there will remain 636, which is $\frac{736}{1728}$ of a Foot. But, as I ſaid before, the beſt way is to work by Decimals; but I have added this Example for their ſakes that underſtand not Decimals: But this, as well as any other Queſtion, may be better reſolved by Croſs Multiplication than by this Common Method; to perform which, if the Learner underſtands it not already, I refer him to the laſt Chapter of this Book; and you will find the Anſwer to be 1 Foot 4 Inches, and 10 Seconds, as in the following Work:

Feet In. ''

1——0——10 The ſuperficial Content of the Baſe.

1——4 The length of the Cylinder.

1
0——4
0——10

1——4——10 In ſolid Contents.

But here I preſume it may not be improper to ſhew the great Error that common Meaſurers are guilty of in the meaſuring of Round Timber, whoſe Method is thus: they girt the Tree, or peice of Timber about, and take the one fourth part of the Circumference for the true Square, which is very erroneous, as may appear by the laſt Example, where the Circumference, or Girt of the Cylinder was 44, and the Content of the Circle 154. Whereas, if you had taken the one fourth of the Circumference 44, which is

11, for the Square Root of the Circle, which multiplied into its ſelf, the Product is but 121; whereas the Content of the Circle is found to be 154, from which ſubſtract 121, and the Remainder will be 33. So much doth the *common-way* want of the true Content of the Circle; from whence it is evident, that according to the common way of meaſuring, there is loſt ſomething above the $\frac{1}{5}$ part of any Round Timber ſo meaſured.

But all that can be ſaid in Defence of this Cuſtom, is, That all Trees growing round, muſt be hewed ſquare, before it can be fit for any uſe; ſo this Advantage in meaſuring may be very well allowed for what goes to waſte in chips, they being good for nothing but the fire; and although Meaſurers think not of this Excuſe, but take their Rule for an abſolute Truth, I preſume was the firſt Occaſion of the Rule, though it is a very Unreaſonable Allowance, as may thus appear; the inſcribed Square of the circle of the Cylinder, in the laſt Example, will be 10 Inches, as you may prove by the following Proportion.

As 1.000 is to 0.225, ſo is the circumference 44 to the inſcribed Square 9.900, which wants but very little of 10 inches; and this is the greateſt Square ſuch a Round piece of Timber can be hew'n into, and this multiplied into its ſelf, gives 98 inches and .010 parts for its content. Now if you add the content of the inſcribed Square 98, and the true content of the circle 154, together, their Sum will be 252, and the Middle, or Mean thereof (which is half their Sum) is 126, and the content, after the common way, was but 121. So that you may ſee this Rule gives an indifferent Allowance both to the Buyer and Seller. But I preſume, notwithſtanding all that hath been ſaid, that the true content ought to be given, and the Meaſure exactly known. And as to the Waſte thereof, Goodneſs or Badneſs of the Timber, there ought to be an allowance made in the Price.

PROP. IV.

How to know how much in length of any Solid Body, having equal Baſes, goes to make a Solid Foot thereof.

Firſt find the ſuperficial content at the End or Baſe, by which divide 1 (to wit, 1 ſolid foot), and the Quotient will be the Length that goes to make a foot ſolid thereof.

Example.

Admit there is a piece of Timber, or any other ſolid body, that is terminated at each end by two equal Geometrical Squares, whoſe ſide is 1.55, and it be required to know how much of the Length thereof goes to make a foot ſolid.

To perform which, firſt find the ſuperficial content at the End or Baſe, by *Propoſition* the 1*ſt*, of the laſt *Chapter*, which you will find to be 2.4025, by which divide 1, and the Quotient will give .416 foot, or 5 inches, as in the following Work.

1.55

```
   1.55
   1.55
  ------
    775
   775
  155
 -------
2.4025) 1.0000000 (.416
          96100
          -------
          39000
          24025
          -------
          149750
          144150
          -------
           (5600)
```

PROP. V.

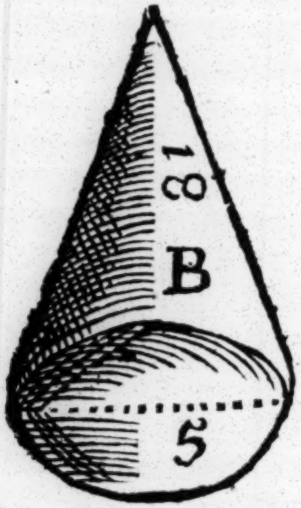
How to find the ſolid Content of a Cone.

Firſt find the ſuperficial content of the circle at the Baſe by (*Propoſition* the 10*th*, 11*th* or 12*th* of the laſt *Chapter*, which multiply by ⅓ of the heighth, and the Product will be the ſolid content of the *Cone*.

Example:

Example.

Admit there is a Cone repreſented by the Figure B, whoſe Diametre at the Baſe is 5 feet, and its Heighth, or Altitude, is 18 feet, whoſe ſolid Content is required.



To find which, firſt find the ſuperficial content of the Baſe (by *Propoſition* the 11*th* of the laſt *Chapter*), which you will find to be 19.64, which multiply by $\frac{1}{3}$ of the heighth, which is 6, and the Product will give 117.84 feet, which is the ſolid content of the Cube required.

PROP.

PROP. VI.

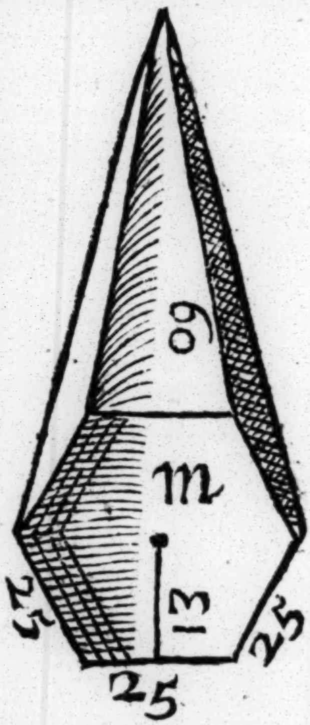
How to find the Solid Content of a Pyramid.

A Pyramid is a Silid comprehended under plain Surfaces, and forms a Triangular, Quadrangular, or any Mutangular Baſe, diminiſhing equally leſs and leſs, till it diminiſhes in a Point at the Top as a Cone.

To find the ſolid content of any ſuch Figure, firſt find the ſuperficial content of the Baſe, by ſome of the Propoſitions of the laſt Chapter; which multiply into $\frac{1}{3}$ of its Altitude, or Heighth, and the Product will be the ſolid content thereof.

Example:

Admit there is a Pyramid repreſented by the Figure M, whoſe Baſe is a Hexagon, the ſide of which is 25 feet, and its Perpendicular heighth is 60 feet, whoſe ſolid content is required.



To perform which, firſt find the ſuperficial content of the Baſe, by *Propoſition* 5. of the laſt *Chapter*; *viz.* by multiplying half the Sum of the ſides, which is 75 feet, by the Perpendicular (let fall from the Center to the midſt of one of the ſides), which will be 13 feet, and the Product will give 975 feet for the ſuperficial content of the Baſe; which multiply by $\frac{1}{3}$ of the heighth 20, and the Product 19500 feet for the ſolid content of the Pyramid required.

PROP. VII.

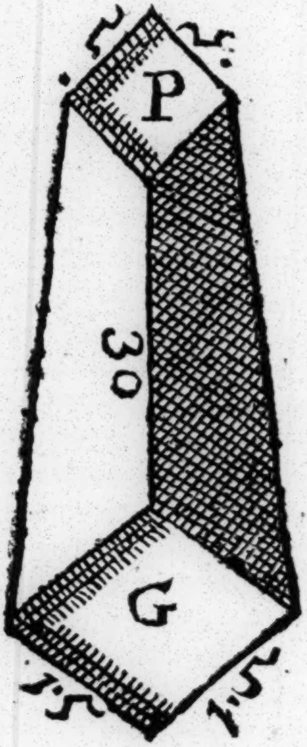
How to find the Solid Content of the Segment of a Cone or Pyramid.

Here note, that all tapering Timber, or Stone, *&c.* whoſe Baſes are Regular Figures, are Segments of either a *Cone* or *Pyramid*.

To find the ſolid content of any ſuch Segment, firſt find the ſuperficial content of both the Baſes, by ſome of the Propoſitions of the laſt *Chapter*, then multiply the ſuperficial content of the greater Baſe by the ſuperficial content of the leſſer, and extract the ſquare Root of that Product; then add that ſquare Root, and the ſuperficial content of the Two Baſes together, and their Sum multiply by $\frac{1}{3}$ part of the Length, and that Product will give the ſolid content of the Segment required.

Example.

Admit there is a Segment of a Pyramid, whoſe Baſes are Squares, repreſented by the Figure P G, and the ſide of the great Square at G is 1.5 foot, or 1 foot 6 Inches, and the ſide of the leſſer at P is .5 foot, or 6 Inches, and the Length of the ſaid Segment is 30 feet, whoſe ſolid content is required.



To find which, firſt find the ſuperficial content of both the Ends by *Propoſition* the firſt of the laſt *Chapter*, the greater of which you will find to be 2.25 feet, and the leſſer 0.25 foot, then multiply the ſuperficial content at the greater end at G 2.25, by the ſuperficial content of the leſſer at P .25, and the Product will be .5625 feet; then extract the ſquare Root of that Product, which you will find to be .75 feet, to which add the ſuperficial content of the Two Ends, and their Sum will be 3.25, which multiply by $\frac{1}{3}$ part of the Length, which is 10 feet, and the Product will be 32.50 feet, which is the ſolid content of the ſaid Segment required, as in the following work,

```
 1.5     .5      2.25               2.25
 1.5     .5       .25                .25
 ---     ---    -----                 75
 75     .25      1125               ----
15       ---     450                3.25
 ---            ------                10
2.25             .5625(.75          ----
 ---              49               32.50
                  ---              -----
             145)0725
                  725
                 -----
                  (0)
```

If you work the ſame by Vulgar Arithmetick, you will find the content to be 32 feet 6 Inches.

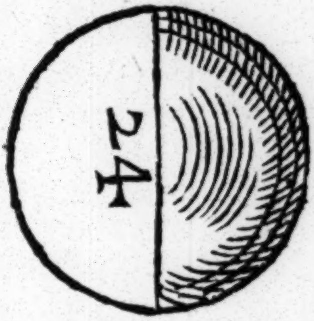
PROP. VIII.

How to find the Solid Content of a Globe, or Sphere, the Diametre being given.

To find which work by the following Proportion,
As 6 times 7, which is 42,
Is to 22,
So is the *Cube* of the Diametre of any Globe
To the ſolid content thereof.

Example.

Admit there is a Globe or Sphere repreſented by the Figure following, whoſe Diametre is 24 Inches, and be required to find the ſolid content thereof.



To perform which, firſt cube the Diametre, 24 Inches, whoſe *Cube* you will find to be 13824 Inches; then work by the before-going Proportion, and ſay, As 42 is to 22, ſo is 13824 to the ſolid content of the ſaid Globe, which you will find to be 7241 $\frac{6}{42}$ Inches.

PROP. IX.

How to find the Solid Content of a Globe, or Sphere, the Circumference being given.

To find which, work by the following Proportion,

As 1.0000
Is to 0.16887,

So is the Cube of the Circumference of any Globe
To the ſolid content thereof.

PROP. X.

How to meaſure any Body that is hollow.

Admit it were required to find the ſolid content of a hollow Tree, or of any other hollow Body whatſoever; To perform which, firſt you muſt find the ſolid content thereof, as though it were not hollow; then find the ſolid content of the Concavity, as though it were Maſſy, and ſubtract it from the whole content, and the Remainder will be the ſolid content of the hollow body.

PROP. XI.

How to find the Solid Content of any Solid Body, of what Form ſoever, ſuch as Geometry can give no Rule for the meaſuring thereof.

To perform which, take ſome convenient Veſſel, and fill the ſame to a convenient heighth with clean water, and make a Mark juſt how high the water reacheth; then put the Body (whoſe ſolid content is required) into the water, which will cauſe the water to riſe above the Mark; then take ſo much of the water out of the Veſſel, as is raiſed above the Mark, and put the ſame into an hollow Cube, which have in readineſs for that purpoſe; then find the ſolid content of the ſaid Cube, ſo high as the water reacheth, which ſhall be the ſolid content of the ſaid body required.

CHAP. III.

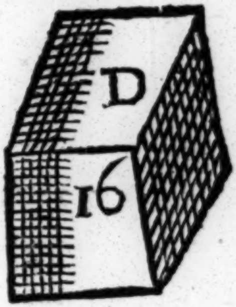
Of GAUGING.

GAuging of Veſſels is no other than finding the ſolid content of the concavities in Inches, as taught in the laſt Chapter, and Dividing the ſame by the number of cubick Inches, contained in a Gallon of the Liquor contained in the ſame, which according to the Eſtabliſhment of the Exciſe for Ale, is 282, and for Wine, 231 Inches.

PROP. I.

How to Gauge a Cubical Veſſel.

Admit there is a cube-Veſſel repreſented by the Figure D, whoſe ſide is 16 Inches, and it be deſired to know how many Gallons of Wine or Ale the ſame will hold.



To find which, firſt find the ſolid content of the ſaid cube in Inches, as taught in Propoſition the firſt of the laſt Chapter, which you will find to be 4096 Inches, which reduce into Gallons, by dividing the ſame by 282 for Ale or Beer, and the Quotient will be 14.5 which are the number of Gallons of Ale or Beer the ſaid Cube will hold, and for Wine, Divide the ſolid content of the ſaid cube by 231, and the Quotient will give 17.73 for the number of Gallons of Wine the ſaid cube will hold, as in the following Work.

16
16

96
16

256
16

1536
256

4096

282)4096(14.52
282

1276
1128

1480
1410

700
564

(136)

231)4096(17.73
231

1786
1617

1690
1617

730
693

(37)

To perform the ſame by the Line of Numbers.

I. *For* Ale *or* Beer.

Extend your Compaſſes always from the Gauging Point, which for Ale is 16, into the ſide of the cube, which in this Example is 16, and he ſame extent will reach from he ſaid 16.8, being turned twice ver unto 14·5 Gallons of Ale or Beer.

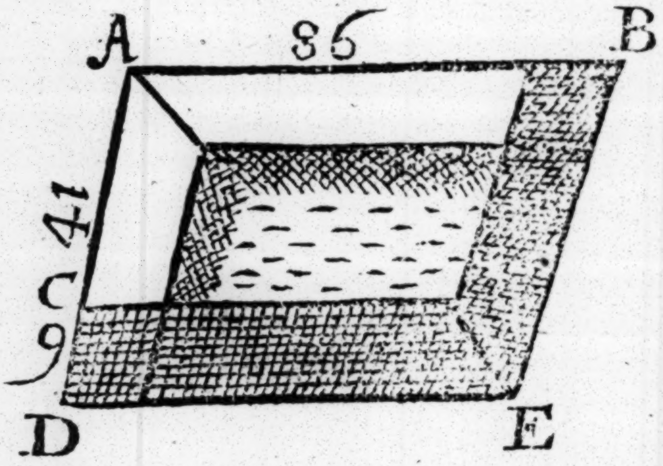
II. *For* Wine.

Extend your Compaſſes from the auging Point for Wine, which is lways $15\frac{2}{10}$, into the ſide of the ube 16, and the ſame extent being urned twice over, will reach from he ſaid 16, unto 17·73 Gallons of Vine.

PROP. II.

How to find the Contents of a Square eſſel in Gallons of Ale or Wine.

Admit there is a Square Veſſel preſented by the figure A B C D E, whoſe Length AB, is 86 Inches, and Breadth AC, 41 Inches, and 'its Depth CD, 9 Inches; and it be Required to know how many Gallons of Ale, Beer or Wine, the ſaid Veſſel will hold.



To find which firſt find the Solid Content of the ſaid Veſſel, as before Taught in the Meaſuring o Solids; which you will find to be 31734 Inches, which Reduce into Gallons, by Dividing the ſame by 282 for Beer or Ale, and 231 for Wine, as in the laſt Propoſition, ſo will you find the ſaid Veſſel will hold 112.53 Gallons of Beer or Ale, or 137.37 Gallons of Wine. As in the following Work.

```
     86
     41
   ----
     86
   344
   ----
   3526
      9
   ----
  31734
```

```
282)31734(112.53
    282
    ---
     353
     282
     ---
      714
      564
      ---
      1500
      1410
      ----
       900
       846
       ---
        54
```

```
231)31734(137.37
    231
    ---
     863
     693
     ----
     1704
     1617
     ----
       870
       693
       ----
       1770
       1617
       ----
       (153)
```

How to perform the ſame by the Line of Numbers.

To perform which you muſt firſt find a mean Number, between the Length A B, 86 Inches, and the Breadth A C, 41 Inches, by Multiplying the Length 86, by the Breadth A C 41; and the Product will be 3526, and then Extracting the Sqnare Root of the ſaid Product, which Root is the Number required, which you will find to be 59.38 Inches

Or Thus, by the Line of Numbers.

Take the Middle way between 86, and 41, and you will find it the ſame as before, *viz.* 59.38 inches.

Then for Ale.

Extend your Compaſſes from the Gauging point 16.8, to the mean Number 59.38 Inches, and the ſame Extent will reach from the Depth 9 Inches, turned twice over unto 112.53 Gallons, of Ale or Beer, as before.

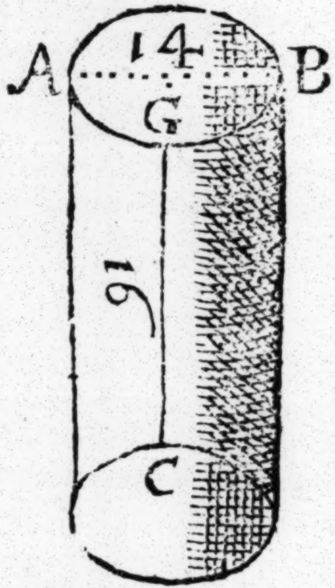
For Wine,

Extend your Compaſſes from the Gauging point for Wine 51.2, to the mean Number before found 59.38 Inches and the ſame Extent will reach from the Depth 9 Inches, turned twice over, to 137.37 Gallons of Wine, as before.

PROP. III.

How to find the Contents of a Cylinder Veſſel in Gallons of Ale, Beer or Wine.

Admit there is a Cylinder Veſſel repreſented by the figure A B C G, whoſe Diamitre A B is 14 Inches, and the Length thereof G C 16 Inches, and it be required to know how many Gallons of Ale, Beer or Wine this ſaid Veſſel will hold.



To find which firſt find the Solid Contents of the ſaid Cylinder as taught in Propoſition the Third of the laſt Chapter, which you will find to be 24.64 Inches, which Reduce into Gallons, by Dividing the ſame by 282, for Beer and Ale, and 231 for Wine; and you will find the ſaid Veſſel to hold 8.73 Gallons, of Beer or Ale, and 10.66 Gallons of Wine, as in the following Work.

```
   7      As 7—22—49
   7                22
 ----             ------
  49                98
                    98
                  ------
                7)1078(154
                  7     16
                  -    ----
                  37   924
                  35   154
                  --   ----
                  28   2464
                  28   ----
                  --
                  (0)
282)2464(8.73        231)2464(10.66
    2256                 231
    ----                 ---
    2080                 1540
    1974                 1386
    ----                 ----
    1060                 1540
     846                 1386
    ----                 ----
    (214)                (154)
```

Or thus,

Square the Diametre A B, 14 whoſe Square is 196, which Multiply by the Length G C 16, aud the Product will be 2136 which Divide by 359, for Beer or Ale, and by 294 for Wine, ſo will you find as before; the ſaid Veſſel will hold 8.73 Gallons of Beer or Ale, or 10 66 Gallons of Wine.

How to performe the ſame by the Line of Numbers.

I. *For Ale or Beer.*

Extend your Compaſſes from the Gauging point for Ale or Beer 18.95, unto the Diametre 14, and the ſame Extent will reach from the Length 16, being twice turned over to 8.73 Gallons of Beer or Ale.

II. *For Wine.*

Extend your Compſſes from the Gauging point for Wine 17.15 unto the Diametre 14, and the ſame Extent will reach, being twice turned over from the Length 16, to 10.66 Gallons of Wine.

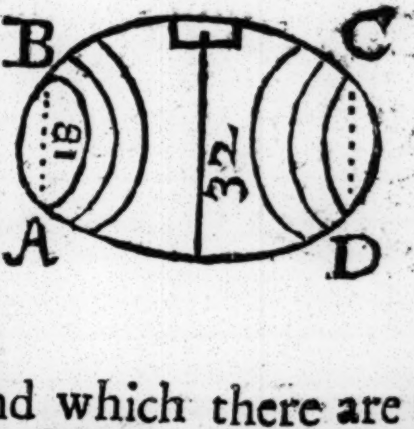
PROP.

PROP. IV.

How to find the Content of any Pipe, Butt, Barrel, Hogſhhead or Cask.

Example.

Admit there is a Cask Repreſented by the Figure ABCD, whoſe Diametre at the Head AB is 18, and the Diametre at the Bung 32, and the Length is 40 Inches; and it be required to know how many Gallons of Ale or Wine the ſame will hold.



To find which there are ſeveral ways, but I ſhall only mention two, the firſt is Mr. *Oghtreds's* Method, which is thus, firſt by Propoſition the 11*th.* of the *3d.* Chapter of Meaſuring, find the Contents of the Circles at the Bung and Head, which you will find to be 254.57 Inches for the Contents of the Circle at the Head, and 804.57 for the Aria, or Contents of the Circle at the Bung, then take two Thirds of the Contents of the Circle at the Bung, which is 536.38, and one Third of the Contents of the Circle at the Head, which is 84.85, which add together, whoſe Sum will be 621.23, which Multiply by the Length of the Veſſel 40, and the Product will be 24849.20 Inches, which is the Solid Content of the ſaid Veſſel, which Reduce into Gallons by Dividing the ſame by 282 for Beer or Ale, and by·231 for Wine, ſo will you find the ſaid Veſſel to hold 88.11 Gallons of Ale, or 107.57 Gallons of Wine, as in the following Work.

9 As 7—22—81

9 22

81 162

162

7)1782(254.57 $\frac{1}{3}$

14 84.85

38

35

32

28

40

35

50

49

(1)

16 As 7—22—256

16 22

96 512

16 512

256 7)5632(804.57 $\frac{1}{3}$

56 268.19

032 2

28 536.38

40

35

50

49

(1)

536.38|$\frac{2}{3}$ Of the Content of the Circle at the Bung.
84.85|$\frac{1}{3}$ Of the Content of the Circle at the Head.
621.23 The Sum.
40 The Length of the Veſſel.
248 49.20 The Solid Content of the Veſſel.

282)24849.20(88.11
2256
2289
2256
332
282
500
282
(218)

231)24849.20(107.57
231
1749
1617
1322
1155
1670
1617
(53)

Or thus,

Square the Diametre at the Bung, 32, whoſe Square is 1024, which double, and it makes 2048, then you muſt Square the Diametre at the Head 18, whoſe Square is 324 which you muſt add to the double of the Square of the Diametre at the Bung 2048, and their Sum will be 2372, which Multiply by the Length of the Veſſel 40, the Product will be 94880, which you muſt Divide by 1077 for Ale, 880 for Wine. ſo will you find as before, the ſaid Veſſel to hold 88, $\frac{104}{1077}$ Gallons of Ale or 107 $\frac{72}{880}$ Gallons of Wine.

How to perform the ſame by the Line of Numbers.

To perform which you muſt find a mean Diametre, between the Diametre at the Head and Bung, thus take the difference between the Diametre at the Bung 32, and the Diametre at the Head 18, which is 14, which you muſt always Multiply by 7, and Divide that Product by 10, and the Quotient you muſt Add to the Leſſer Diametre and ſo will you have 27.8 for a mean Diametre then.

I. *For Ale.*

Extend your Compaſſes from the Gauging point 18.95 unto the mean Diametre 27.8 and the ſame diſtance will reach from the Length 40, being Twice turned over to 88.11 Gallons of Ale.

II. *For Wine.*

Extend your Compaſſes from the Gauging point 17.15 to the mean Diametre and the ſame Extent will reach from the length 40 being twice turned over to 107.57 Gallons of Wine.

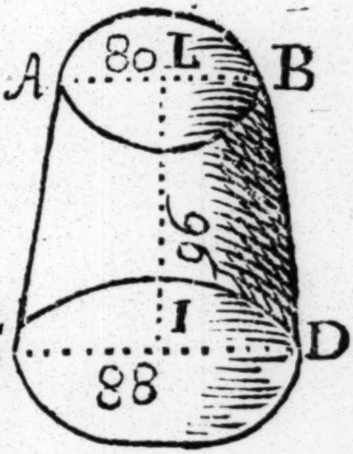
PROP. V.

How to Meaſure Brewers Tuns or Marſh-Fatts

Admit there is a Tun or Marſh-Fat, Repreſented by the Figure

ABCD,

A B C D, whoſe Diametre at the bottom C D, is 88 and the Diametre at the top A B 80, Inches, and its Depth L I 96 Inches, and it be required how many Barrels of Ale the ſame will hold.



To find which, firſt find the Solid Content of the ſame, as taught in Propoſition the *6th.* of the laſt Chapter which you will find to be 532625.92 Inches and $\frac{6}{10}$, which Divide by 282 the Number of Cubick Inches contained in a Gallon, and the Quotient will be 1888.74, the Number of Gallons of Ale the ſame will hold, which Divide by 36, the Number of Gallons in a Barrel, and the Quotient will be 52.46, the Number of Barrels of Ale the ſame will hold, as in the following Work.

As 7—22—1600	As 7—22—1936
22	22
3200	3872
3200	3872
7)35200(5028.57	7)42592(6084.57
35	42
020	059
14	56
60	32
56	28
40	40
35	35
50	50
49	49
(9)	(60)

608457

```
          608457
          502857
          ------
         4259199
        3042285
       4867656
      1216914
     30422850
     --------  -----
     30596686.1649(553142
     25
     ----
 105 556
     525
     ----
1103 3466
     3309
     ----
11061)15786
      11061
      -----
110624)472516
       442496
       ------
1106282)3002049
        2212564
        -------
        (789485)
```

6084.57

```
      6084.57
      5028 57
      5531.42
     ---------
     16644.56
           32
     ---------
      3328912
     4993368      36)
     ---------   -----
282)532625.92(1888.74(52.46
    282           180
    ----         -----
     2506          88
     2256          72
     ----         -----
      2465         167
      2256         144
      ----        -----
       2099        234
       1974        216
       ----       -----
        1252       (18)
        1128
        ----
        (124)
```

Or thus,

Square the Diametres of the Top and Bottom, then Multiply one Diametre by the other, and Add that Product and the Square of the Two Diametres together, and Multiply their Sum by the Depth of the ſaid Veſſel, and that Product Divided by 1077, and the Quotient will give 1888, which is the Number of the Gallons of Ale the ſaid Veſſel will hold; which Reduce into Barrells as before.

How to perform the ſame by the Line of Numbers.

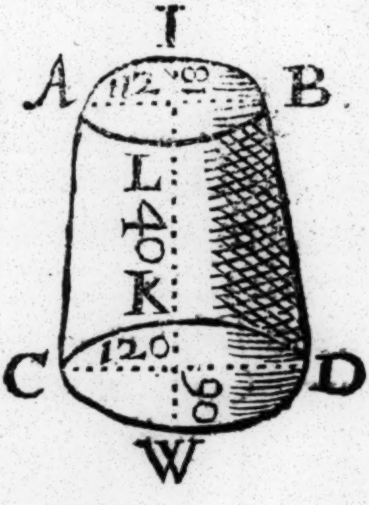
Firſt find a mean Diametre, thus Add the Two Diametres 80 and 88 together, and their Sum will be 168, then take half thereof, which is 84, for the mean Diametre: Then Extend your Compaſſes from the Gauging Point for Barrels (of Ale or Beer), which is 113.7. unto the mean Diametre 84, and the ſame diſtance will reach from the Heighth 96, to turned twice over unto 52.44 Barrels.

PROP.

PROP. VI.

How to Meaſure an Oval Tun.

Admit there is an Oval Tun Repreſented by the Figure A B C D, whoſe Length at the Bottom C D is 120, and the Breadth K W 90, and the Length at the Top A B 112 and the breadth I L 84 and the Depth of the Veſſel L K 40 Inches; and it be required to know how many Barrels of Ale the ſame will hold.



To find which you muſt firſt find a mean Number between the Length and Breadth of the Oval at the Bottom, *viz.* 120 and 90, by Multiplying the Length 120 by the Breadth 90, and the Product will be 10800, and then Extract the Square Root of that Product, and it will give 103 92 for the mean Number required, then likewiſe by the very ſame Method you muſt find a mean Number, between the Length at the Top 112, and the Breath 84, which you will find to be 97, which Two mean Numbers you muſt Add together, and their Sum will be 200.90, then take half thereof, which is 100.46, which Multiply by the Depth of the Tun 40, and the Product will be 4018 40, which Divide by 359, and the Quotient will be the Number of Gallons of Ale the ſame will hold, which you will find to be 1119.331, which Reduce into Barrels by Dividing the ſame by 36, the Number of Gallons, in a Barrel and the Quotient will give 31.09 Barrels.

How to perform the ſame by the Line of Numbers.

To perform which firſt find the mean Numbers between the Length and the breadth of the Two Ovals. Thus Extend your Compaſſes from the Breadth of each Oval to its Length; then your Compaſſes being opened to half that diſtance, will reach from the *B*readth to the mean Number deſired, by which Method you will find the mean Numbers as before, to be 103.92 and 97, whoſe Sum is as before 200.92, the half of which is 100.46 which is the mean Diametre; then Extend your Compaſſes from the Gauging Point for Barrels, which is 113.7 to the mean Diametre 100.46, and the ſame will reach from the the Depth 40, turn'd twice over unto 31.09 the Number of Barrels of Ale the ſaid Veſſel will hold.

PROP.

PROP. VI.

How to turn Barrels into Gallons, Beer-meaſure.

To perform which, work by the following Proportion.

As 1 is to 36, the Number of Gallons contained in a Barrel, ſo is the Number of Barrels given, to the Number of Gallons contained therein.

Example.

Admit it be required to know, how many Gallons of Beer are contained in 6 Barrels.

To perform which by Arithmetick, work by the Rule of *Three*, as followeth:

If 1——36——6
6
——
216 Gallons,
Anſwer 216 Gallons.

To perform the ſame by the Line of Numbers.

Firſt, ſet one Foot of your Compaſſes in 1, and extend the other to 36; then, with your Compaſſes at that diſtance, ſet one Foot in 6, and the other will reach to 216, the Number of Gallons contained in the ſaid 6 Barrels.

PROP. VIII.

How to turn Gallons of Beer or Ale into Wine.

To perform which, ſay, by the *Rule of Three*,

As 9 is to 11,
So is the Number of Ale-Gallons
To the Number of Wine.

Example.

Admit there is a Veſſel that contains 66 Gallons of Beer, and it be required to know, how many Gallons of Wine the ſame will hold.

To perform which, by Arithmetick, work by the *Rule of Three*, as followeth:

If *9*——11——*66*
66

66
66

---

*9)7*26(80 Anſwer $80\frac{6}{9}$ Gal.
72
(05)

To Perform which by the Line of Numbers.

Set one Point of your Compaſs in *9*, and extend the other to 11; then with your Compaſſes at that diſtance ſet one Point in *66*, and the other will reach to 80.*6*.

☞ Here Note that the Proportion between *9* and 11 was found by Multiplying 282, the Number of Cubick Inches in an Ale Gallon by *9*, and Dividing that Product by 231, the Cubick Inches in a Wine Gallon, by which Method you will find 11 ſomething too much, tho it is near enough for ordinary uſe.

PROP. IX.

How to turn Gallons of Wine into Gallons of Ale.

Example.

Admit there is a Veſſel that will hold 44 Gallons of Wine, and it be required to know how many Gallons of Ale the ſame will hold.

To perform which by Arithmetick, work by the *Rule of Three*, as followeth.

```
If 11—9—44
         9
     ———————
   11)396(36
       33         Anſwer 36 Gallons
     ——————
        66
        66
      ——————
        (0)
```

To Perform the ſame by the Line of Numbers.

Set one Foot of your Compaſſes in 11, and Extend the other to 9, then with your Compaſſes at that diſtance, ſet one Foot in 44, and the other will reach to 36, the Gallons of Ale the ſaid Veſſel will hold.

PROP. X.

How to turn Gallons of Ale into Barrels.

Example.

Admit there is a Veſſel that holds 216 Gallons, and it be required to know how many Barrels are contained therein.

To perform which by Arithmetick, ſay by the *Rule of Three*, If 36, the number of the Gallons contained in one Barrel will have one Barrel, what will 216 Gallons have, and you will find the ſaid Veſſel to contain juſt 36 Barrels.

To Perform the ſame be the Line of Numbers.

To find which, ſet one foot of your Compaſſes in 36, and Extend the other to 1, then with your Compaſſes at that diſtance ſet one Foot in 216, and turning the other towards 1, it will cut the Line in 36, the number of Barrels contained in the ſaid Veſſel.

P R O P. XI.

How to Gauge a Ship, and thereby to find how many Tuns her Burthen is.

To perform which, Meaſure the Length of the Keel, the Breadth of the Midſhip-Beam, and the Depth of the Hold; which three Numbers Multiply one into the other, and Divide the Product 95, and the Quotient will give the true Burthen of any Merchant's Ship; but for Man of War, divide the Product by 100, becauſe in Men of War there is allowance made for Ordnance, Maſts, Sails, *&c.*

CHAP. IV.

Of Meaſuring Artificers VVork, viz. Carpenters, Joyners, Plaſterers, Painters, Paviers, Glaſiers, Bricklayers, &c.

BEcauſe the method I have uſed in Multiplying, may be new to many, altho it varies but very little from the method uſed by the common Meaſurers; for I Work by *Croſs Multiplication*, as they do; all the difference is, I have ſuppoſed the Inch to be Divided into 12 equal parts, which I call *Seconds*, and each of thoſe Parts to be Divided into 12 other equal Parts, which I call *Thirds*, *&c.* So is the Foot Divided Duodecimally, ſo that 12 *Thirds* makes 1 *Second*, 12 *Seconds* 1 *Inch* or *Prime*, 12 *Inches* 1 Foot.

Before I proceed I ſhall ſhew you how to Multiply after the Method I have uſed in this Chapter; to perform which, obſerve the following general Rules.

General Rules.

1. If you Multiply Feet into Feet, the Product will be Feet.

2. If you Multiply Inches into Feet, the Product will be Inches.

3. If you Multiply Inches into Inches, the Product will be Seconds.

4. If you Multiply Seconds into Feet, the Product will be Seconds.

5. If you Multiply Seconds into Inches, the Product will be Thirds.

6. If you Multiply Seconds into Seconds, the Product will be Fourths.

Example.

Admit there is given 17 Feet, 11 Inches, 10 Seconds, to be Multiplyed by 6 Feet, 9 Inches, 4 Seconds.

To perform which, firſt ſet down the Multiplicand and Multiplier, as in the following Work; then Multiply the Feet in the Multiplicand 17 by the Feet, in the Multiplier 6, and the Product will be 102 Feet; then Multiply the Feet in the Multiplicand 17, by the Inches in the Multiplier 9, and the Product will be 153 *Inches*, which is 12 Feet 9 Inches, which ſet down as in the following work, *viz.* the Feet under the Feet, and Inches under the Inches; likewiſe Multiply the Feet in the Multiplier 6, into the Inches in the Multiplicand 11, and the Product will be 66 Inches, which is 5 Feet 6 Inches, which likweiſe ſet down as you ſee in the work; then Multiply the Inches in the Multiplicand 11, into the Inches in the Multiplier 9, and the Product will be 99 Seconds, which is 8 Inches, 3 Seconds; ſet down the Inches under the Inches, and Seconds under the Seconds, as you ſee done; Then Multiply the Seconds in the Multiplicand 10, into the Feet in the Multiplier 6, and the Product will be 60 Seconds, which is juſt five Inches, which ſet down under the Inches; likewiſe Multiply the Seconds in the Multiplyer 4, into the Feet in the Multiplycand 17, and the Product will be 68 Seconds, which is 5 Inches, 8 Seconds, which ſet down as you ſee in the Work; then Multiply the Second in the Multiplier 4, into the Inches in the Multiplicand 11, and the Product will be 44 Thirds, which is 3 Seconds 8 Thirds; likewiſe Multiply the Seconds in the Multiplicand 10, into the Inches in the Multiplier 9, and the Product will be 90 Thirds, which is 7 Seconds and 6 Thirds, which likewiſe ſet down as in the Work; then Multiply the Seconds in the Multiplicand 10, into the Second in the Multiplier 4, and the Product will be 40 Fourths, which is 3 Thirds and 4 Fourths, which ſet down as in the Work, then add theſe ſeveral Products all up together, and the Sum will be 121 Feet, 10 Inches, 10 Seconds, 5 Thirds and 4 Fourths, which is the Product deſired.

17	11	10		
6	9	4		
102				
12	9			
5	6			
	8	3		
	5	0		
	5	8		
		3	8	
		7	6	
			3	4
121	10	10	5	4

Example 2.

Admit it be required to Multiply 165 feet, 6 inches, 4 ſeconds by 79 feet, 2 inches, 3 ſeconds.

To perform which, work in every reſpect as in the laſt Example, and you will find the Product to be 13107 feet 8 inches 9 ſeconds and 3 thirds, as in the following work.

165——6——4
79——2——3

1485
1155

13035
39——6
27——6
1——0
2——2——4
3——5——3
0——8
1——6
1——0

13107——8——9——3——0

How to Meaſure *Carpenters Work.*

Carpenters Work, which is Flooring, Roofing, Partitioning, Joyſting, &c. is Meaſured by the Square that is 10 feet every way, ſo that a ſquare containeth 100 ſuperficial feet, in Meaſuring of which, the thickneſs is not conſidered, but an allowance made in the price, according to the

length

ſtrength or ſlightneſs of the work; ſo that the Meaſuring thereof is no other than the Meaſuring of a Plain Superficies, as before taught; nor indeed is any other work belonging to Building, Except Bricklayers work.

Example.

Admit there is a Floor or Partitioning which is 156 Feet 6 Inches in the Length, and 55 Feet 4 Inches in Breadth, whoſe Content is Required.

To perform which Multiply the Length by the Breadth, and the Product will be the Content in Feet and Inches, and then Divide the Feet by 100, and the quotient will give the Content in Squares, and the Remainder will be parts of a Square.

To do which, by Croſs Multiplication, firſt ſet down the Length and the breadth, as you ſee in the following Work. Then Multiply the Feet in the Length 165, by the Feet in the Breadth 55, and the Product will be 9075 Feet, then Multiply the Feet in the Length 165 by the Inches in the Breadth 4, and the Product will be 660 Inches, which is 55 Feet, which Set down under the Feet as you ſee done; then Multiply the Feet in the Breadth 55, by the Inches in the Length 6, and the Product will be 330 Inches, which is 27 Feet 6 Inches, which Set down as in the Work, *viz.* the Foot under the Feet, and the Inches under the Inches, then Multiply the Inches in the Length 6, by the Inches in the Breadth 4, and the Product will be 24, which are ſeconds, 12 of which make an Inch, ſo that it is Juſt two Inches, which Set down as you ſee, then Draw a Line and Add theſe ſeveral Products together, and the Sum will be 6157 Feet 8 Inches; then Divide the Feet by 100, the Number of Feet contained in the Square, which is done by only cutting off the two firſt Figures towards your right hand, *viz.* 75, which is $\frac{57}{100}$ of a Square and the reſt Squares, which 57 Multiply by 0, and divide that Product by 100, and the Quotient will give 5 Feet, and there will remain 70 which is $\frac{70}{100}$ of a Foot, which 70 likewiſe Multiply by 12, Divide by 100, and the Quotient will give 7 *I*nches and $\frac{40}{100}$ of an Inch, ſo have you found the Content of the ſaid floor to be 91 Squares 5 Feet 7 Inches and $\frac{40}{100}$ of an Inch, as in the following Work.

```
 Feet   Inches
  165 — 6
   55   4           75
 ——————————         10
  825             ————
  825              5|70
 ————               12
 9075              ————
   55—00            140
   27—06            70
        2—00       ————
 ——————————————    7|40
 61|57—08—00
```

Example. 2.

Admit there is a Floor of Joyſting that is 65 Feet 8 Inches Long, and 15 Feet 4 Inches Broad, whoſe Content is Required.

To find which work in every Reſpect as Taught in the former Example, and you will find the Content of the ſame to be 10 Squarse, 7 Inches, as you ſee in the Following Work.

65—8	6
15—4	10
325	60
65	12
975	120
10—0	60
21—8	
2—8	7|20
10|06—10—8	

How to Meaſure the Roof of any Building.

Example.

Admit there is a Building that is 93 Feet Long, from the out-ſide of the Wall at one end, to the out-ſide of the Wall at the other end, and the Breadth from the out-ſide of one Wall, to the out-ſide of the other Wall 36 Feet; and it be required to know how many Squares of Roofing there is in that Building.

To perform which, if the Building be true Roof'd, you need not Meaſure the Length of the Rafters or the ſide-pieces, but take this for a General Rule, *viz.* that the Length of each Rafter is three Fourths of the Breadth of any Building; ſo in this Example, the Breadth of the Building being 36 Feet $\frac{3}{4}$, thereof is 27 Feet, which is the Length of each Rafter, or Breadth of one ſide of the Roof, which being doubled, for ſo it muſt be, for both the ſides is 54 Feet, which you muſt Multiply by the Length of the Building 93, and the Product will be 5022 feet for the Content of the ſaid Roof, which reduce into Squares by dividing the ſame by 100, ſo will you find 50 Squares, and 2 feet, and $\frac{20}{100}$ of a foot, to be the Content of the Roof required, as in the following work.

4)36(9
36(3
(0) 27

27
27
54.
93
162
486
50'22

22
10
2'20

How to Meaſure the ſides of a Timber Building.

Example:

Admit there is a Timber Building that is 36 feet broad at each end, and 93 feet long, and the height to the Rafters, or ſide of the Roof, is 69 feet, whoſe Content is required.

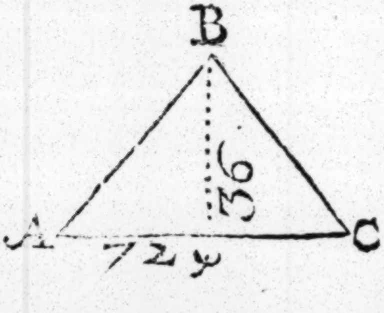
To perform which, becauſe the two ſides are equal, and likewiſe the two ends are equal, you need not ſtand to find the Content of each ſide ſeverally, but add all the four ſides together, whoſe ſum will be 258 feet, which Multiply by the height of the Building 69, and the product will be 17802, which reduce into ſquares, ſo will you find the Content of all the four ſides of the ſaid wod -Building to be 178 ſquares, and $\frac{2}{100}$ of a ſquare, as in the following Work.

```
     36
     36
     93
     93
   -----
    258
     69
  -------
   2322
  1548
  -------
  178.02
  -------
```

How to Meaſure the Gable-end of a Timber Building.

Example.

Admit it be required to find the Content of the Gable-end of a Building whoſe breadth is 72 feet from the out-ſide of one Wall, to the out-ſide of the other, the Gable-end of which Building is repreſented by the following Triangle ABC, whoſe Baſe A C, is 72 feet, equal to the Breadth of the Building, and the Perpendicular B Q is 36 feet.



To find the Content of which, Multiply 72, the Baſe by 18, halve the Perpendicular, and the Product will give 1296 feet, which reduce into ſquares, ſo will you find the Content of the ſaid Gable-end to be 12 ſquares, and 9 feet, and 6 Inches.

How to Meaſure Paving, Painting, Wainſcoting and Plaſtering, &c.

Theſe are all Meaſured by the Yard Square, containing 9 feet, ſo that in Meaſuring of this ſort of Work, all that it differs from the former, is only inſtead of Reducing the Content into Squares by dividing the ſame by 100, you muſt Reduce it into Square Yards by dividing the feet by 9, the number of feet in a ſquare Yard.

Example 1.

Admit there is a Court that is Paved, containing 76 feet 6 Inches in Length, and 17 feet and four Inches in Breadth, whoſe Content is required.

To find which, Multiply the length of the ſaid Court 76 feet and 6 inches by the breadth 17 feet and 4 Inches, as before Taught, and the Product will be 136 feet, which feet Divide by 9, the number of feet in a Square Yard, and the Quotient will be 147, and 3 will Remain, which is of a $\frac{3}{9}$ Yard ſo is the Content of the ſaid Court found to be 147 Square Yards and $\frac{3}{9}$ of a Yard or one foot, as in the following Work.

```
  76—6
  17—4
  ----
                         9)1326(147
  532                      9
  76                      ---
 ----                      42
 1292                      36
   25——4                   ---
    8——6                   66
       2——0                63
 --------------            ---
 1326——0——0                (3)
 ==============             3
                           ---
                          9)9(1
                            9
                           ---
                            0
```

Example 2.

Admit there is a piece of Wainſcot that is 6 foot long, and 3 feet

6 inches Broad, whoſe Content is required.

To perform which, work in every reſpect as in the foregoing Example, and the Anſwer will be 2 ſquare Yards, and ⅓ of a Yard, or 1 foot, as in the following Work.

6—0
3—6
———
18
3——0
————
21——0

9)21(2
18
———
(3)

Example 3.

Admit there is a Room that is 9 feet 6 inches long, and 8 feet Broad, and 7 feet high, which is Painted, whoſe Content is required.

To perform which, firſt Multiply the breadth by the height, and the Product will be the Content of one end of the Room, which becauſe the two ends are alike, double the ſame, and it will give the Content of both the ends; then alſo Multiply the length of the Room by the height, and the Product will be the Content of one of the ſides, which being doubled, becauſe the ſides are both alike, gives the Content of both ſides, which being added to the Content of both the ends before found, the ſum is the Content of the 4 ſides of the Room required, which reduce into ſquare yards, as before taught, by Dividing the ſame by 9, and the Anſwer will be 27 ſquare yards, and $\frac{2}{9}$ of a yard.

```
*⁎*   9—6                       8—0
      7                         7—0
   ————————                  ————————
     63                         56
      3——6                      56
   ————————                  ————————
     66——6                     112
     66——6                   ————————
   ————————
    133——0
   ————————

9)245(27                       133—00
  18                           112—00
————                         ————————
   65                          245—00
   63
————
  (2)                        *⁎* Note
```

⁂ Note that the Demenſions of a Room that is Painted, is beſt taken by a String, becauſe of the Mouldings, which you bend as you pleaſe, and ſo Meaſure the Mouldings with the reſt, which muſt be done as being part of the Painting.

Example.

Admit there is a Room that is Plaiſtered, that is 16 Feet 8 Inches Long, and 10 Feet 6 Inches Broad, and 7 Feet, 11 Inches High whoſe Content is Required.

To perform which, find the Contents of the 4 ſides of the Rooms, as directed in the laſt Example, which you will find to be 430 Feet, 1 Inch and 8 Seconds, then find the Content of the Top of the Room, which is done by Multiplying the Length of the Room by the Breadth, *viz.* 16 Feet and 8 Inches, by 10 Feet and 6 Inches, and the Product will be 175 Feet, which Add tothe Content of the ſides, and their Sum is theContent of the ſaid Room

whic

which you will find to be 605 Feet 1 Inch and 8 Seconds, which Reduce into Yards, as before taught and ſo will the Anſwer be 67 Square Yards and $\frac{2}{9}$ of a Yard. As in the following Work.

Note that in Meaſuring of Plaiſterers Work, there is no allowance made for the Windows, Doors or Chimnies.

Feet *Inches*
16 — 8
16 — 8
10 — 6
10 — 6

54—4
7 —11

378
49 — 06
2 — 04
3—8

430——1—8

Feet *Inc.* *Sec.*
340 —01 —08
175 —00 — 00

605 —01 — 08

16—8
10 - 6

160
6—8
8—0
4—00

175—00—00

~~6~~(2
~~6~~~~0~~~~5~~(67
~~9~~~~9~~

But here I judge it may not be improper to add, how to find the Superficial Content of Solid Bodies, becauſe Painters do very frequently Paint ſuch Bodies.

How to find the Superficial Content of any Solid Body.

Firſt, *How to find the Superficial Content of a Cylinder.*

Multiply the Length by the Circumference, and the Product will be the Superficial Content deſired.

Example.

Admit there is a Round Pillar that is Painted, whoſe Circumference is 5 Feet, 10 Inches, and the Length thereof is 12 Feet, 8 Inches, and it be required to know how many Yards Square of Painting there isin the ſame.

To perſorm which, Multiply the Length 12 Feet, 8 Inches, by the Circumference, 5 Feet, ″ 10 Inches, and the Product will give, 73 Feet, 10 Inches, 8 Seconds, for the Superficial Content of the ſaid Pillar, which Reduce into Yards, Dividing the Feet by 9, and the Quotient, will give 8 $\frac{1}{9}$ Yards, for the Content of the ſaid Painting.

Secondly, *How to find the Superficial Content of a Parallelepipedon or Square Pillar.*

Add the four Breadths together, and Multiply their Sum by the Length, and the Product will be the Superficial Content of the Square Pillar deſired.

Thirdly, *How to find the Superficial Content of a Cone.*

Multiply half the Circumference at the Baſe by the Height of the Cone, or Multiply half the Height of the Cone by the Circumference at the Baſe, and the Product ſhall be the Superficial Content deſired.

Fourthly, *How to find the Superficial Content of a Pyramid.*

Add all the Dimenſions of the Sides at the Baſe together, and Multiply half their Sum by the Height of the Pyramid, or Multiply half the Height of the Pyramid, by the Sum of all the ſides at the Baſe, and the Product, will give the Superficial Content thereof.

Fifthly, *How to find the Superficial Content of a Globe or Sphere.*

Multiply the Diametre, by the Circumference and the Product, will be the Superficial Content thereof.

How to Meaſure *Glaziers Work.*

Glaziers Work is Meaſured by the Foot, and therefore Multiply the Length, by the Breadth, as before, and the Product is the Content required. But becauſe the Dimenſions of Glaziers Work is taken more than any other ſort of Work, *viz.* in Feet, Inches, and part of an Inch; which makes the reſolution of queſtions of that kind, for the moſt part, ſomething more difficult, than any of the foregoing; therefore I will ſhew you how to perform the ſame here, altho I ſhewed the ſame thing in the beginning of this Chapter.

Example.

Admit there is a Pane of Glaſs that is 6 Feet 8 Inches (or Primes) 6 Seconds in Length, and 5 Feet 9 Inches (or Primes) and 3 Seconds in Breadth, whoſe Content is required.

To perform which, firſt ſet down the Dimenſions, as you ſee in the following Work, then Multiply the Feet in the Length 6, into the Feet in the Breadth 5, and the Product will be 30, which ſet down under the Feet, as in the Work; then Multiply the Inches in the Breadth 9, into the Feet in the Length 6, and the Product will be 54, which are

Inches, which is 4 Feet 6 Inche which likewiſe ſet down, as in the Work, then Multiply the Inches in the length 8, into the Feet in the Breadth 5, and the Product will be 40, which likewiſe are Inches, which is 3 Feet 4 Inches, which likewiſe ſet down as you ſee in the Work, then Multiply the Inches in the Breadth 9, into the Inches in the Length 8, and the Product will be 72, which are parts of Inches or Seconds which is Juſt 6 Inches, then Multiply the *Seconds* in the Breadth 3, into the Feet in the Length 6, and the Product is 18, which are Seconds, which is 1 Inch 6 Seconds; then Multiply the Seconds in the Length 6, into the Feet in the Breadth 5, and the Product is 30, which are likewiſe *Seconds*, which is 2 Inches 6 *Seconds*, all which ſet down as in the following Work. Then Multiply the *Seconds* in the Breadth 3, into the Inches in the Length 8, and the Product is 24, which are parts of *Seconds* or Thirds, which is 2 Seconds, then Multiply the Seconds in the Length

6, into the Inches, in the Inches, in in the Breadth 9, and the Product is 54, which likewiſe is Thirds, which likewiſe is 4 Seconds 6 Thirds, both which ſet down, as you ſee in the following Work *Laſtly*, Multiply the Seconds in the Breadth 3, into the Seconds in the Length 6, and the Product is 18, which are Parts of Thirds or Fourths, which is 1 Third, and 6 Fourths; which ſet down as in the Work, then Add all theſe Products together, and their Sum is the Product of 6 Feet, 8 Inches, 6 Seconds, Multiplied by 5 Feet, 9 Inches, and 3 Seconds; which is 38 Feet, 8 Inches, 6 Seconds, 7 Thirds, and 6 Fourths, which is the Content of the Pane of Glaſs required, as in the following Work.

Feet	Inch.	Secon.		
6	8	6		
5	9	3		
30				
4	6			
3	4			
	6	0		
	1	6		
	2	6		
		2	0	
		4	6	
			1	6
38	8	6	7	6

Example.

Admit there is a Pane of Glaſs that is 13 Feet, 6 Inches, aud 5 Seconds Long, and 6 Feet, 3 Inches, and 9 Seconds Broad, whoſe Content is required.

To perform which Work in every reſpect as in the laſt Example, and its Content will be found to be 85 Feet, 5 Inches, 3 Seconds, 9 Thirds, as in the following Work.

13——6——5
6——3——9

78
3——3
3——0
1——6
9——9
2——6
4——6
1——3
3——9

85——5——3——0——9

How to Meaſure Bricklayers Work.

The Meaſuring of which is more difficult, than any ſort of Work that belongs to Building.

In Meaſuring of which, Obſerve theſe General Rules following.

Firſt, Find the Superficial Content of each Wall, then find the Superficial Content of all the Windows and Doors in each Wall, and Subtract them from the Superficial al Content of the Wall in which they are, and the Remainder will be the Content of the Brick-work of each Wall, in its given thickneſs.

Secondly, That all Walls of what thickneſs ſoever, muſt be Reduced into a Brick and a half thick, by Multiplying the Content by the number of half Bricks, contained in the thickneſs of the Wall, and the Product will be the Content of the ſaid Wall in half a Brick thick, which Divide by 3, the number of the half Bricks, in a Brick and a half, and the Quotient will be the Content of the Wall, in a Brick and a half.

Thirdly, That whereas Carpenters Work is Meaſured by the Square, that is 10 Feet, every way, ſo that the Square contains 100 Feet; ſo Brick-work is Meaſured by the Square Rod, that is, 16½ Feet every way, ſo that the Rod contains 272 Feet.

Fourthly, Having found the Content of all the Walls of any Building, in a Brick and half thick, Add them all into one Sum, and Reduce the ſame into Rods, by Dividing it by 272 the number of the Feet in a Rod, and the Quotient will be the number of Rods, of Brick-work contained in the ſaid Building.

Example.

Admit there is a Building, in which the Walls to the firſt Floor are as followeth, *viz.* the Wall on the Front, and the Back-ſide, are each 16 Feet, 9 Inches Long, the Wall on the Front being 3 Bricks thick, and the Wall at the Back 3 Bricks and a ½ thick, having in each a Door of the ſame Dimenſions *viz.* 2 Feet 6 Inches Wide, and 6 Feet 4 inches High, and in the Front Wall are 2 Windows a-like, each 3 Feet 6 Inches Wide, and 6 Feet 4 Inches High; and the Wall on the Back, hath 2 Windows, one of which is 2 Feet 4 Inches Wide, and 5 Feet 6 Inches High, and the other 3 Feet 2 Inches Wide, and 5 Feet 11 Inches High; and the ſide Walls are each 24 Feet 9 Inches Long, and 2 Bricks thick, and the Floor is 9 Feet 6 Inches High; and it be required to know how many Rods of Brick-work there is in all the Walls to the firſt Floor.

To perform which, firſt find the Superficial Content of the Front Wall, which is done by Multiplying it's Length 16 Feet 9 Inches, into the Heighth of the Wall, or Heighth of the Floor, which is the ſame, *viz.* 9 Feet 6 Inches, and the Product will be 159 Feet, 1 Inch, 6 Seconds, which is the Superficial Content of the Front Wall, and becauſe the Front and Back Wall are of the ſame Length, and the Walls of one Height, it is likewiſe the Superficial Content of the Back Wall, as in the following Work.

Feet	Inches	
16	9	
9	6	
144		
8	0	
6	9	
	4	6
159	1	6

Then find the Superficial Content of the Door and Windows in the Front Wall.

I. *To find the Content of the Door.*

Multiply it's Breadth 2 Feet 10 Inches, and the Product will be 26 Feet 11 Inches, for the Content of the Door, as in the following Work.

2

2——10
9——6

18

7——6
1——0
5——0

26——11——0

Now becauſe the Door in the Front Wall, and the Door in the Back Wall, are alike having found the Content of the one, the Content of the other is likewiſe found.

II. *To find the Content of the Windows.*

Which are 2, both a like, *viz:* each 3 *Feet*, 6 *Inches* Wide, and 6 *Feet*, 4 *Inches* High; ſo that Multiply the Breadth, 3 *Feet*, 6 *Inches*, into the Height, 6 *Feet*, 4 *Inches*, and the Product will be 22 *Feet*, 2 *Inches*, for the Content of one of the Windows, which becauſe the Wall in which they are placed, is all of one thickneſs, therefore double the ſame, and you will have 44 *Feet*, 4 *Inches*, for the Content of both Windows in the Front Wall, as in the following Work.

6——4
3——6

18
1——0
3——0
2——0

22——2——0
22——2

44——4

Thus having found the Content of the Front Wall, to be 159 *Feet*, 1 *Inch*, 6 *Seconds*, and the Content of the Door therein to be 26 *Feet*, 11 *Inches*, and likewiſe the Content of the Windows in the ſaid Wall to be 44 *Feet*, 4 *Inches*.

Then ſet down the Content of the Door and Windows, one under the other, and Add them together as in the following Work, and their Sum will be 71 *Feet*, and 3 *Inches*, which Subſtract from the Content of the Wall, before found to be 159 *Feet*, 1 *Inch*, 6 *Seconds*, and the Remainder will be 87 *Feet*, 10 *Inches*, 6 *Seconds*, which is the Content of the Brick-work in the Front Wall, in the given thickneſs, *viz.* 3 Bricks thick, as in the following Work.

Feet	*Inc.*
26 —	11
44 —	04
71 —	03

Feet	*Inc.*	*Sec.*
159 —	01 —	06
71 —	03 —	00
87 —	10 —	06

Then by the ſame method, find the Contents of the Brick-work in the Back-Wall, whoſe Superficial Content is already found to be 159 *Feet*, 1 *Inch*, 6 *Seconds*, and likewiſe the Door in the ſaid Wall, is likewiſe found to be 26 *Feet*, 11 *In-*

ches, being both the ſame with thoſe in the Front, ſo that there Remains only the Windows in this Wall to be found.

To perform which, Multiply their Width into their *Height*, as before, ſo will you find the Content of the one to be 12 *Feet*, 10 *Inches*, and the Content of the other, to be 18 *Feet*, 8 *Inches*, 10 *Seconds*, as in the following Work.

5—6	5—11
2—4	3—2
10	15
1—8	2—9
1—0	10
2—0	1—10
12—10—0	18—8—10

Then Add the Content of the Door and Windows together, and Subſtract their Sum from the Content of the Wall, as before, and the Remainder will be 100 *Feet*, 7 *Inches*, 8 *Seconds*, which is the Content of the Brick-Work, in the Back-Wall, in the given thickneſs of 3½ Bricks thick.

Feet	*Inc.*	*Sec.*
16	11	00
18	08	10
12	10	00
58	05	10

Feet	*Inc.*	*Sec.*
159	01	06
58	05	10
100	07	08

Then find the Content of the ſide Walls, which are each 24 *Feet*, 6 *Inches, Long.*

To perform which Multiply the Length 24 *Feet*, 9 *Inches*, into the Height 6 *Feet*, 6 *Inches*, and the Product will be 235 *Feet*, 1 *Inch*, 6 *Seconds*, for the Content of one of the ſide Walls, which are a like in Length, *Height*, and Thickneſs; therefore double the ſame and you will have 470 *Feet*, 3 *Inches*, for the Brick-Work of both the ſide Walls, in the given thickneſs, *viz.* 2 Bricks thick, as in the following Work.

24	9	
9	6	
216		
12	0	
	4	6
235	1	6
235	1	6
470	3	0

Thus having found the Content of all the Walls, to the firſt Floor, to be as followeth, *viz.* the Wall on the Front 87 *Feet*, 10 *Inches*, 6 *Seconds*, in 3 Bricks thick, and the Wall on the Back 100 *Feet*, 7 *Inches*, 8 *Seconds*, in 3 ½ Bricks thick and the 2 ſide Walls 470 *Feet*, 3 *Inches*, in 2 Bricks thick.

After the ſame manner find the Content of all the Walls, to the Second Floor, and ſo on till you have found the Content of all the *Brick* Walls in the *Building* you are to Meaſure.

Have

Having ſo done there *Remains* nothing more to be done, only that you *Reduce* the *Content* of each Wall, into a *Brick* and a half thick, and Add them all into 1 Sum, and *Reduce*, your Sum into *Rods*, by the former *Rules*. *But* becauſe in all *Building* you find ſeveral Walls of one thickneſs, therefore the beſt way to perform the ſame, is as followeth, Set down the *Content* of all the Walls of one thickneſs by themſelves, and all the Walls of another thickneſs by themſelves, in *Columns* *Ruled* for that purpoſe, as in this Example.

2 Bricks.			*3½ Bricks*			*3 Bricks*		
F.	*I.*	*S.*	*F.*	*I.*	*S.*	*F.*	*I.*	*S.*
209″	3″	0	100″	7″	8	87″	10″	0

The *Content* of the Front Wall was found as before, to be 87 *Feet*, 10 *Inches*, in 3 Bricks thick, which ſet down a *Column* marked at the Top with it's thickneſs, as you ſee is done here, and under the ſame, in the Column, place the Content of all the reſt of the Walls of the ſame thickneſs, and the like is to be underſtood of all the reſt, of the Wall of any Building whatſoever, then Add each Column up, and Reduce the Sum of each, Column into a Brick and ½ thick, and when ſo done, Add them all together, and Divide their *Feet* in their Sum by 272, the Number of *Feet* in a Rod, and the Quotient will be the Content of the ſaid Building, in Rods. but in this Example, the trouble of Adding each Column is Spared, becauſe there is but one Row of Figures in each Column, which, that the foregoing Rules may be the better underſtood, we will call the Sum of each Column; to Reduce which Columns into 2 ½ Brick.

1. Take the Sum of the firſt Column towards your Right Hand, which is 207 *Feet*, 3 *Inches*, which is the Content of all the Walls in this Example, which are 2 Bricks thick.

thick, and Multiply the ſame by 4, the Number of half Bricks Contained in the thickneſs, and the Product will be 829 *Feet*, which is the Content of the ſaid Walls, in ½ a Brick thick, which Divide by 3, the Number of ½ Bricks, contained in 1 ½ Brick, and the Quotient will be 276 *Feet*, 4 *Inches*, which is the Content of all the Walls of 2 Bricks thick, in 1 ½ Brick thick, as in the following Work.

```
  Feet  Inch.
  207 — 3
        4
————————————Feet   Inch.
3)829—0(276 — 4
  6
  ——
  22
  21
  ——
   19
   18
   ——
    1
```

Then take the Sum of the Second Column, 100 *Feet*, 7 *Inches*, 8 *Seconds*, which Multiply by 7, the number of the ½ Bricks contained in the thickneſs, and the Product will be 704 *Feet*, 5 *Inches*, 8 *Seconds*, which Divide by 3, the Number of ½ Bricks contained in 1 Brick and ½, and the Quotient will be 234 *Feet*, 9 *Inches*, 10 *Seconds*, the Content of all the VValls of 3½ Bricks thick, in 1½ Brick thick, as in the following VVork.

```
Feet  Inch.  Sec.
100 — 7 ——— 8
            7
———— ————————Feet  Inch.  Sec.
3)704 ——— 5 — 8(234 — 9 — 10
  6
 ———
  10
   9
 ———
  14
  12
 ———
   2
```

Then likewiſe Reduce the Sum of the Third Column 87 *Feet*, 10 *Inches*, after the ſame Method, into 1 Brick and ½ thick, which you will find to be 175 *Feet*, 8 *Inches*, as in the following VVork.

```
Feet  Inch.
 87 — 10
       6
———————— Feet  Inch.
3)527 — 0(175 — 8
  3
 ———
  22
  21
  ———
   17
   15
   ———
    2
```

Thus having Reduced the Sum, of each Column in this Example, into 1 Brick and ½ thick, Add them all together, and their Sum will be 686 *Feet*, 9 *Inches*, 10 *Seconds*, which is the Content of all the Brick-VVork Required, in 1 Brick and $\frac{1}{2}$ thick, which Reduce into Rods, by Dividing it by 272, the Number of *Feet* contained in a Rod, ſo will you have 2 Rods, and $\frac{142}{272}$ of a Rod, which is ſomthing above $\frac{1}{2}$ a Rod, for the Content of the Brick-Work, to the firſt floor required, as in the following Work.

Feet	*Inch.*	*Sec.*
276	04	00
334	09	10
175	08	00
686	09	10

```
272)686(2
    544
    ———
    142
```

What hath been ſaid, I ſuppoſe is ſufficient to Explain the beforegoing Rules, ſo that to give you any more Examples of that kind will be needles.

But becauſe there is ſome Walls that have Watet-tables, that is Built ſome 3, ſome 5 *Feet* High, which Water-table is many times $\frac{1}{2}$ a Brick thick, and ſome times more, I ſhall ſhew you how to Meaſure any ſuch Wall.

To Meaſure which, firſt find the Content of the Wall, as before taught, and Reduce the ſame into Brick and half Thick, then find the Content of the Water-Table, after the ſame manner, and likewiſe Reduce it into 1 $\frac{1}{2}$ Brick Thick, then Add the Content of the Water-Table, to the Content of the Wall, and the Sum is the Content of the ſaid Wall with the Water-Table, which Reduce into Rods, as before Taught.

Example.

Admit there is a Wall that is 2 Bricks Thick being 91 Feet, 6 Inches Long, and 17 Feet, 3 Inches high, which hath a Water-Table $\frac{1}{2}$ a Brick Thick, and 3 Feet High, whoſe Content is required.

To find which, firſt find the Content of the Wall by Multiplying the Heighth into the Length, and the Product will be 1578 Feet, 4 Inches, 6 Seconds, which Reduce into 1 $\frac{1}{2}$ Brick Thick, by Multiplying it by 4, the Number of half Bricks, contained in the given Thicknſes, and Dividing the Product by 3 the Number of half Bricks contained in 1 ½ Brick, and ſo will you find the Content of the Wall in Brick and ½ Thick to be 2104 Feet, 6 Inches, as in the following Work.

Feet	*Inch.*	
91	6	
17	3	
637		
91		
1547		
8	6	
22	9	
	1	6
1578	4	6

Feet

```
Feet  Inch.  Sec.
1578   4      6 .
              4
—————————————————  Feet   Inch.
3)6313 — 6 — 0(2104— 6
  6
  —
  03
   3
  ——
  013
   12
  ——
    1
```

Then find the Content of the Water-Table, by Multiplying it's Heigth 3 Feet, into the Length of the Wall 91 Feet, 6 Inches, and the Product will be 274 Feet, 6 Inches, which Reduce into 1 ½ Brick Thick, which becauſe the Thickneſs of the ſaid Water-Table is a ½ Brick Thick is done by the Dividing by 3, and the Quotient will be 91 Feet, 6 Inches, for the Content of the ſaid Water-Table in Brick and ½, as in the Following Work.

Feet *Inch.*
91 — 6
3
273
1 — 6
3)274 — 6(91 — 6
27
04
3
1

Then Add the Content of the Wall in a Brick and half Thick, before found to be 2104 *Feet*, 6 *Inches*, to the Content of the Water-Table in 1 ½ Brick thick and their Sum will be 2196 *Feet*, for the Content of the Wall Required, which you muſt Reduce into Rods, as before taught, ſo will you find 8 Rods, and 20 *Feet*, of Brick-Work, to be in the ſaid Wall, as in the following Work.

2104——6
91——6

272)2196——0(8
2176

(20)

How to Meaſure Chimnies.

The Common way allowed by all Meaſurers, is thus, girt the Chimney Round, below the Mantle-Tree; if it be in a Wood Building where the Wall of the Honſe, doth go to make the Back of the Chimney, and take the girt of the Chimney for the length, and the heighth of the Room, for the Breadth, and then Multiply the one into the other, and the Product take for the Content, in the ſame thickneſs as the Jaumes are on, which muſt be Reduced into 1 $\frac{1}{2}$ Brick.

But if the Chimney ſtands againſt a Brick Wall, then the Wall at the Back being the ſame with the Wall of the Houſe, and therefore being

Meaſured, as Part of the Wall, they only girt it Round to the Wall, and Multiply that into the height of the Room, and take the Product for the Content of the Ghimney in the ſame thickneſs as the Jaums are on, which you muſt Reduce as before into 1 ½ Brick thick.

Example.

Admit there is a Chimney whoſe girt round below the Mantle Tree, is 10 *Feet*, 6 *Inches*, and the height of the Room where the ſame ſtands, 9 *Feet*, the Jaums of which Chimny, is 2 Bricks thick, whoſe Content is required.

To perform which, Multiply the girt 10 *Feet*, 6 *Inches*, into the height of the Room 9 *Feet*, and the Product will give 94 *Feet*, 6 *Inches*, for the Content of the ſaid Ghimny, in the ſame thickneſs as the Jaumes is on, which is 2 Bricks thick, which you muſt Reduce into 1 ½ Brick thick, as before directed, ſo will you find the Content thereof in Brick and one half to be 129 *Feet*, as in the following Work.

```
10 ——— 6
       9 ——— 0
————————————
94 ——— 6
       4
————————————
3) 378(1290
   3
   ——
   07
    6
   ———
    18
    18
   ———
   (9)
```

Having by ſome of the beforegoing methods, found the Content of all the Chimnies, you are next to find the Content of Shafts, to perform which, you muſt girt them about in the narroweſt place and take that for the breadth, and their height, for the Length, and multiply one into the other, and the Prodnct will be the Content, the Shaft or Shafts in the ſame thickneſs as their breadth is of, for you muſt underſtand that they are Meaſured as if they were a Solid Peice of Brick-Work which you muſt Reduce into 1 ½ Brick thick.

How to Meaſure Tyling.

Tyling is Meaſured by the Square, Containing 100 *Feet*, and is in every reſpect the ſame with that of Roofing, taught in Meaſuring Carpenters Work.

Example.

Admit there is a *R*oof of a Building that is Tyled the length of which Building, from the out-ſide of the Wall at one End, to the out ſide of the Wall at the other End is 15 *Feet*, and the *B*readth from the ont-ſide of the one Wall, to the out-ſide of the other, 9 *Feet*, 6 *Inches*, and it be required to find the Content of the ſaid Tyling which you will find to be 2 *Squares*, 1 *Foot*, 3 *Inches*, and $\frac{81}{100}$ of an *Inch*.

```
4)9—6(2—4—6
  8        3
  —  ————————
  1    7—1—6
       7—1—6
      ———————
      14—3—0
      15
      ———————————
      70
     14
    —————
    210
      3—9
  ———————————————
   2|13—9
  ———————————————
```

2|13

```
2|13
  10
----
1|30
  10
----
 300
  81
----
3|80
```

Thus much of Meaſuring of Artificers Work relating to Building, I preſume what hath been ſaid, is ſufficient for the meaneſt Capacity to underſtand, how to Meaſure any ſort of Building Timber, Stone, or any ſort of Body whatſoever.

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